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SPECIFICATION COVER SHEET

Client: Gowanus Canal Remedial Design Group

Project: Gowanus Canal – 4th St Turning Basin Pilot Study – Dredging and Capping

Project #: HPH106A

SPECIFICATION SECTION: 31 41 16 **TITLE:** SHEET PILE INSTALLATION

SPECIFICATION PREPARED BY:
(Specification Preparer, SP)
Signature [signature] Date 5/19/2017
Name Panos Andonyadis

SCOPE AND FORMAT CHECKED BY:
(Scope and Format Checker, SFC)
Signature [signature] Date 5/19/2017
Name Lauren Wellborn

DETAILED REQUIREMENTS CHECKED BY:
(Detailed Requirements Checker, DRC)
Signature [signature] Date 5/19/17
Name Darrell Nicholas

APPROVED BY:
(Specification Approver, SA)
Signature [signature] Date 19 May 2017
Name J.F. Beech

Record of Revision (Number and initial all revisions)

Rev. No.	Reason	Date	By	Checked	Approval
0	TB4 Pilot Study Design – Issued for Bid	05/19/17	PA	LSW	JFB

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SECTION 31 41 16

SHEET PILE INSTALLATION

PART 1 GENERAL

1.01 SUMMARY

A. The Work covered in this Section includes installation of sheet pile walls that will act as the bulkhead support system (bulkhead support) required to support the existing bulkheads in the 4th Street Turn Basin during dredging and capping. The sheet pile wall alignments are shown on the Construction Drawings.

B. The Contractor shall retain the services of a vibration monitoring specialists (Vibration Specialist) to monitor for sheet pile driving-induced vibrations that may affect the condition of nearby structures.

1.02 RELATED SECTIONS, PLANS, AND DOCUMENTS

A. Section 01 32 00 Construction Progress Documentation

B. Section 01 33 00 Submittals

C. Section 01 35 29 Health, Safety, and Emergency Response Requirements

D. Section 01 71 23 Site Surveying and Grade Control

E. Section 01 78 00 Project Closure

F. Section 02 60 16 Sediment and Floatables Containment

G. Section 31 23 00 Upland Excavation and Fill

H. Section 31 51 13 Anchor Installation

I. Contract Documents

1.03 REFERENCES

A. The following standards (versions as of April 2017):

1. American Institute of Steel Construction (AISC) Steel Construction Manual Code;

2. ASTM A572 – Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel;

3. ASTM D422 – Standard Test Method for Particle-Size Analysis of Soils; and

4. State of New York Department of Transportation – Standard Specifications (NYS Specifications).

1.04 SUBMITTALS

A. The Contractor shall submit the following to the Owner's Representative in accordance with Section 01 33 00:

1. Bulkhead Support Workplan which shall include:

   a. Detailed construction schedule for the sheet pile walls, including sequence of sheet pile installation, backfilling, and removing obstructions;

   b. List of materials, methods, and equipment to be used for installation of the sheet piles, including WEAP analysis that supports selected equipment is capable of driving sheet pile to target depths;

   c. List of materials, methods, and equipment for the placement and vibratory compaction of backfill material placed behind sheet pile wall;

   d. Material certifications and mill certificates for all materials used in the construction of the sheet pile walls and backfill;

   e. A description of the template system to be used to maintain horizontal positioning and verticality of the sheet piling during pile driving;

   f. Proof and references of Contractor qualifications in accordance with this Section;

   g. A quality control plan that meets the quality control requirements of this Section. Quality control includes survey monitoring of the existing bulkhead and installed sheet piles during installation of the sheet pile walls and throughout dredging and capping; and

   h. Bulkhead stabilization contingency strategy that includes (i) means to shore surficial damage to an existing bulkhead; and (ii) means to install a deadman sheet pile and tie rod system, and to install tieback anchor system to support deep seated bulkhead instability in accordance with Section 31 51 13.

2. Vibration Monitoring Workplan to include:

   a. The name and qualifications of the Vibration Specialist to perform the monitoring;

b. A list of monitoring equipment to be used for the Work, including relevant certificates of calibration;

c. A description of the monitoring procedures; and

d. A template for daily monitoring reports to include at a minimum:

i. Date of monitoring;

ii. Name of the reporter/monitoring technician;

iii. Identification of the equipment used for monitoring;

iv. Plot of measured particle velocity for the reported work day;

v. Explanation of any peak exceedances and observations of any damaged caused by exceedances; and

vi. Identification of any potential sources of vibration in addition to the pile driving equipment.

3. Baseline Existing Bulkhead Condition Survey to include:

a. Photographs of each existing bulkhead taken at low tide to document the pre-construction conditions of the bulkheads;

b. Identification of all existing outfalls along the existing bulkhead; and

c. Baseline (or initial) survey of the optical survey markers to be used to monitor the movements of the existing bulkheads. An initial drawing of the survey shall be prepared in accordance with Section 01 71 23.

4. Baseline Bulkhead Support Survey to include a baseline (or initial) survey of the optical survey markers to be used to monitor the movements of the bulkhead support sheet piles. An initial drawing of the survey shall be prepared in accordance with Section 01 71 23.

5. Bulkhead Support Construction Records that include:

a. Photographs of each bulkhead taken at low tide to document the post-construction conditions of the bulkheads spanning the top of the bulkhead to the water surface; and

b. As-built details such as pile location, top elevations, size, and length. The as-built record documents and drawings shall be prepared in accordance with Section 01 71 23 and Section 01 78 00.

6. Daily Progress Reports in accordance with Section 01 32 00.

7. Contingent Repair Workplan (as necessary) that includes:

   a. Detailed descriptions of the means, materials, equipment, and methods for implementing the repair; and

   b. Shop drawings and supporting structural calculations sealed by the Contractor' engineer, a professional engineer licensed in the State of New York.

1.05 CONSTRUCTION QUALITY CONTROL

A. The Contractor shall prepare Bulkhead Support Construction Records of the bulkhead support upon completing construction of the bulkhead support. Any deviances from the Construction Drawings will be reported to the Owner's Representative. Dredging within the Canal cannot commence until the sheet pile walls are accepted by the Owner's Representative.

1.06 HEALTH AND SAFETY REQUIREMENTS

A. The Contractor shall comply with environmental health and safety/training requirements in accordance with the approved Health and Safety Plan and Section 01 35 29.

1.07 QUALIFICATIONS

A. The Contractor shall demonstrate experience in the installation of marine sheet pile walls. The Contractor shall provide references for three recent projects similar in scope.

B. The Vibration Monitoring Specialists shall have a minimum of five years of relevant monitoring experience and be a professional engineer licensed in the State of New York.

PART 2 PRODUCTS

2.01 MATERIAL AND EQUIPMENT

A. The Contractor shall furnish all labor, materials, tools, and equipment necessary for completion of this Work.

B. Sheet Piles

1. All steel sheet piling shall be new and unspliced material of the type and weight shown on the Construction Drawings with F_y = 50 ksi and conforming to ASTM A572 unless otherwise reviewed and accepted by the Owner's Representative. Sheet piles are not required to be epoxy coated or hot-dip galvanized.

2. Steel sheet piles and special fabricated shapes shall be of a design that ensures continuous interlock throughout the entire length when in place.

C. Sheet Pile Interlocks

1. All interlock pieces shall be new and unspliced material of the type and weight shown on the Construction Drawings with F_y = 50 ksi and conforming to ASTM A572 unless otherwise reviewed and accepted by the Owner's Representative.

2. Steel sheet piles and special fabricated shapes shall be of a design that ensures continuous interlock throughout the entire length when in place.

D. All welding shall use E70XX electrodes.

E. Granular Backfill meeting the requirements of 31 23 00.

PART 3 EXECUTION

3.01 GENERAL

A. The Contractor shall confirm the existing Site conditions prior to starting Work and shall notify the Owner's Representative of any conditions which are not similar to those shown on the Construction Drawings.

B. The Contractor shall become familiar with the conditions at each property where a bulkhead support will be installed, including utility locations, and shall contact the New York City one-call system as required by law.

C. The Contractor shall maintain Site stability during construction of all elements of the sheet pile walls and existing bulkheads. If excessive movements (as defined in this Section) or Site instability are detected, the construction shall be immediately halted, the Owner's Representative notified, and corrective measures shall be implemented by the Contractor under the direction and supervision of the Owner's Representative at no cost to the Owner.

D. The Contractor is responsible for the structural integrity and stability of existing structures located nearby and upland of the bulkhead support Work. Any damage induced or caused by implementation of the Work shall be repaired by the Contractor at no cost to the Owner. Acceptance and approval of the Bulkhead Support Plan and/or Vibration Monitoring Plan do not indemnify the Contractor or its subcontractors from responsibility for repairing damages caused by Work-related construction activities.

E. Any design changes or field adjustments needed during construction shall be approved by the Engineer and Owner's Representative prior to executing the change in Work.

3.02 INSTALLATION

A. The Contractor shall control sediment and floatables in accordance with Section 02 60 16 during sheet pile installation.

B. The sheet piles shall be installed along the alignment presented on the Construction Drawings.

C. The finished sheet pile walls shall consist of continuous interlocking sheet piles driven in place. After the cap is installed, the top of sheet pile walls shall be cut down to the design elevations and the space between the existing bulkhead and the sheet pile wall backfilled with Granular Backfill.

D. The Contractor shall provide adequate drainage for the existing permitted pipes that penetrate the existing bulkheads.

E. The selected sheet pile driving method and equipment shall be consistent with the expected ground conditions at the Site. The sheet piles shall be driven to the minimum tip elevations without damaging the sheet piles. The interlocks between adjacent sheet piles shall not be damaged. Equipment shall be used which permits impact energy to be distributed over the tops of the sheet pile.

F. Sheet piles shall be driven using a template system or other control measures which maintains horizontal position within three inches from plan location shown on the sheet pile wall drawings and verticality within one percent of total length. Misalignment or out of plumb sheets greater than the specified tolerances shall be reported to the Owner's Representative for review and recommendation for remedial action. The cost of such remedial action is solely the responsibility of the Contractor.

G. Sheet piling shall be driven to the minimum depths shown on the Construction Drawings or to refusal. Refusal is defined as greater than 12 blows per 1 inch of penetration, less than 4 inches of penetration during one minute of continuous vibratory driving, or until there is visible damage to the pile head. Sheet piles that meet refusal prior to achieving target depths shall be reported to the Owner's Representative for review and recommendation for remedial action. Encountered obstructions shall be removed by the Contractor.

H. Backfilling:

1. The space between the installed sheet pile wall and the existing bulkhead face shall be backfilled with Granular Backfill per Section 31 23 00. For cantilevered sections of bulkhead support, the backfill shall first be placed to an elevation consistent with mean low water level prior to dredging. After dredging and capping is complete, and after the top of the bulkhead support is cut to final elevations, backfill shall be placed to top of bulkhead support.

2. The Granular Backfill shall be vibrated after placement for compactness.

3. The Contractor shall not place frozen Granular Backfill or perform backfilling when the Canal is frozen.

I. All existing instrumentation and survey monitoring systems shall be maintained by the Contractor. The Contractor shall inform the Owner's Representative of any conflicts between existing instrumentation and monitoring systems and the Work. The Contractor shall replace any instrumentation damaged during the Work at no additional cost to the Owner.

J. The Contractor shall protect existing bulkheads and upland structures from damage. Any property damages caused by the Contractor shall be replaced or repaired at no expense to the Owner.

1. Observed surficial damage to existing bulkheads shall require shoring and/or replacement of the facing.

2. If the existing bulkhead is observed to move greater than two inches laterally towards the Canal, then deep seated movements could be occurring. Under such conditions, the Contractor shall obtain the services of a New York licensed professional engineer to develop a shoring design that can be integrated with the bulkhead support and executed consistent with the Contract Documents. On such occasions, the Contractor shall prepare a Contingent Shoring Design of proposed bulkhead repairs and replacement work and submit it to the Owner's Representative. Shoring design shall be consistent with Specification 31 51 13. Repair and replacement work shall not commence without approval of the Owner's Representative.

3.03 VIBRATION MONITORING

A. The Contractor shall monitor the vibration levels 15 ft from, or at the distance where the nearest buildings or structures are located within 15 ft, from, whichever is closer, any sheet pile installation activity throughout this Work. Vibration Monitoring shall be performed by the Contractor's Vibration Specialist.

B. Vibration monitoring shall be performed during all pile driving activities on a daily basis.

C. Measured peak particle velocity shall not exceed 0.4 in/sec measured along any axis. If the vibration tolerances are exceeded, work shall cease immediately and the Owner's Representative shall be notified. Work may resume after (i) it is confirmed that there is no structural damage or movement of nearby (within 100 ft) structures; and (ii) the Contractor develops an alternative construction approach to mitigate vibrations that is approved by the Owner's Representative.

3.04 QUALITY ASSURANCE AND QUALITY CONTROL

A. The Contractor shall provide a qualified superintendent and/or field engineer who will be the Quality Control Representative and be the point of contact for and responsible for contractor quality control. The Quality Control Representative will be present at the Site at all times during construction of the sheet pile walls, and shall conduct all testing and monitoring as described in the Contractor's approved quality control plan provided as part of the Bulkhead Support Workplan.

B. The Contractor shall establish optical survey markers on top of the edge of the existing bulkhead with markers set a maximum of 25 ft apart along the existing bulkhead pile wall alignment to monitor displacements. The optical survey markers shall be installed and a Baseline Existing Bulkhead Condition Survey shall be taken before any construction activities begin. The Contractor shall perform daily surveys of the existing bulkhead survey markers, record incremental displacements, and calculate cumulative displacements. The daily surveys shall be performed in accordance with Section 01 71 23 and shall continue until the end of construction activities. If the cumulative displacement at any survey marker of the existing bulkhead equals or exceeds two inches from the baseline position, the Contractor shall stop all construction work and notify the Owner's Representative. Work may resume after the Owner's Representative assess the condition of the existing bulkhead and identifies the required contingency bulkhead support to be implemented per the Contractor's contingency strategy within the Bulkhead Support Workplan.

C. The Contractor shall establish optical survey markers on top of the edge of the 3rd Avenue Bridge with markers set a maximum of 25 ft apart along the superstructure of the bridge to monitor for displacements. The optical survey markers shall be installed and a baseline survey of the bridge shall be included with the Baseline Existing Bulkhead Condition Survey. The Contractor shall perform daily surveys of the bridge, record incremental displacements, and calculate cumulative displacements. The daily surveys shall be performed in accordance with Section 01 71 23 and shall continue until the end of construction activities. If the cumulative displacement at any survey marker of the bridge equals or exceeds a 0.25 inches from the baseline position, the Contractor shall stop all construction work and notify the Owner's Representative.

D. The Contractor shall establish optical survey markers on top of the bulkhead support sheet pile wall with the markers set a maximum of 25 ft apart along the sheet pile wall alignment to monitor displacements. The optical survey markers shall be installed and a Baseline Bulkhead Support Survey shall be performed. The Contractor shall perform daily surveys of the bulkhead support survey markers and record incremental and cumulative displacements. The surveys shall be performed in accordance with Section 01 71 23 and shall continue until the end of construction activities.

E. The Owner's Representative will perform quality assurance testing of the Contractor's quality control to verify the quality of work. The quality assurance testing or inspections

performed by the Owner's Representative in no manner relieves the Contractor of the responsibility to construct all work to conform to the Construction Drawings.

[END OF SECTION]